

# Source Identification Protocol Project

Presentation to the State Water Resources  
Control Board



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# BACKGROUND

- **The Clean Beach Initiative has disbursed nearly \$100M and been effective at improving beach water quality**
  - Your appointment of a Clean Beach Task Force to help DFA identify and recruit suitable projects has been exemplary
- **However, the low hanging fruit are gone**
  - Diversions to treatment plants worked great
- **The challenge now is in identifying the problem to be fixed at remaining beaches**
  - Difficult to fix something when you don't know the cause
  - Cities don't have the expertise to identify fecal sources
  - The number of good CBI proposals has declined as a result

# OPPORTUNITY

- **Microbial source tracking methods have blossomed in the last decade with advances in molecular biology**
- **However, beach managers don't know how to employ them**
  - Which methods work best (alone or in combination)?
  - How many samples are required to reach a conclusion?
  - When to use genetic methods vs. traditional methods, such as dye testing?
- **The Clean Beach Task Force suggested creating a source identification team**
  - Develop a guidance document that will help improve CBI proposals
  - Provide a document that fulfills the State's AB538 requirements

# **FOUR PROJECT ELEMENTS**

- **Methods evaluation study to identify the best source identification tools**
- **Develop and demonstrate source identification protocols at four priority beaches**
- **Prepare a manual that describes a cost-effective standardized approach to source identification**
- **Train local laboratories in these methods and protocols**

# WHY A METHOD EVALUATION STUDY?

- **Many candidate methods**
  - The field has exploded in the last decade
- **Most new methods have been evaluated primarily by the method developers**
  - Limited geographical evaluation
  - Few alternative sources to assess specificity
  - No comparative studies to determine which ones work best
- **The evaluation study provided a basis for recommending the best measurement tools**

# METHOD EVALUATION APPROACH

- **Challenge the methods with 64 blind samples**
  - Some combination of 12 different fecal source types
- **41 MST methods evaluated**
  - 27 participating laboratories
- **Most methods run by multiple labs to assess method repeatability**
  - Its not just whether the method developers can do it
  - We need to know whether the method is transferable to others



# OUTCOME

- **Success! We identified methods that were both specific and sensitive for five key fecal sources:**
  - Human
  - Dog
  - Pig
  - Cow
  - Gull
- **More importantly, we got the scientific community to agree with the findings**
  - Most every key scientist in the field participated
  - Brought them in early to help design the study
  - Brought them back later to help develop the conclusions
  - Water Research dedicated a whole journal issue to the study
  - We achieved a level of consensus that is rare in science

# DEMONSTRATION PROJECTS

- **Not enough to have high tech laboratory techniques**
  - How do the different pieces fit together?
  - How many samples are needed?
- **Four teams selected a “beach bummer” to begin testing source identification approaches**
  - Stanford University– Cowell Beach
  - UCSB – Arroyo Beach
  - UCLA – Topanga
  - SCCWRP – Doheny
- **Two goals**
  - Apply and refine a source identification protocol
  - Find the problem at the beach and generate a Clean Beach Initiative grant proposal from the beach “owner”



# WE FOUND SOURCES

- **Cowell Beach**

- Initial community suggestion: Bacterial regrowth in the beach wrack
- Not the case: We found a human signature to the fecal material
- Subsequent efforts pinpointed a leaking sewer line that is being repaired

- **Doheny**

- Initial community suggestion: The sea gull colony that resides there
- Gulls were part of the problem, but there was a distinct human signature
- Dye testing found leaking pipes that are now being replaced

- **Arroyo Burro**

- Initial community suggestion : Dogs on the beach
- Source markers confirmed that dogs were the primary source
- However, we found higher dog markers upstream; dogs in the watershed were a larger problem than dogs on the beach

# LESSONS LEARNED

- **Use a toolbox approach**

- The new genetic tools are great, but the traditional tools are also an important part of the solution
- Dye testing and camera inspections were critical in our demonstration projects

- **The simplest answer is often the right one**

- Start by looking for leaking pipes
- Create a GIS inventory of the infrastructure

- **Get everyone in the same room**

- There are many agencies with management responsibility
- They all hold different pieces of the puzzle and don't always interact

# SOURCE IDENTIFICATION MANUAL

- **Capture what we learned into a written guidance document**
  - How does a beach manager get started?
- **Hypothesis driven**
  - Source identification can be an expensive proposition
  - Identify potential sources and use targeted sampling to address each
- **A phased approach**
  - Start with cheaper methods to localize and refine the problem
  - Use more expensive methods in a focused manner

# ORGANIZATIONS TRAINED

- **Los Angeles County Sanitation Districts**
- **Orange County Sanitation Districts**
- **City of Los Angeles**
- **City of San Diego**
- **Ventura County Public Health Laboratory**
- **San Diego County Department of Public Works**
- **Orange County Public Health Laboratory**
- **Long Beach Public Health Laboratory**
- **San Mateo County Public Health Laboratory**
- **San Francisco Water Utility**
- **Santa Cruz County Environmental Health**
- **Monterey Bay Aquarium Research institute**
- **NOAA Southwest Fisheries Science Center**
- **Weston Solutions**